

COCCIDÆ (SCALE INSECTS) OF JAPAN.

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CONTENTS.

PLATES VII-XIII.

	PAGE.
I. INTRODUCTION	44
II. DESCRIPTIONS OF NEW SPECIES AND IDENTIFICATIONS OF OLD SPECIES.....	46
Subfamily MONOPHLEBINÆ	46
<i>Monophlebus</i>	46
<i>Icerya</i>	47
Subfamily MARGARODINÆ	47
<i>Sasakia</i>	47
Subfamily COCCINÆ.....	48
<i>Lecaniodiaspis</i>	48
<i>Kermes</i>	49
<i>Eriococcus</i>	50
<i>Gossyparia</i>	52
<i>Dactylopius</i>	52
<i>Phenacoccus</i>	56
<i>Sphaerococcus</i>	56
<i>Antonina</i>	57
<i>Pseudolecanium</i>	57
Subfamily LECANIINÆ.....	58
<i>Pulvinaria</i>	58
<i>Takahashia</i>	61
<i>Ericerus</i>	62
<i>Ceroplastes</i>	62
<i>Lecanium</i>	63
Subfamily DIASPINÆ	65
<i>Aspidiotus</i>	65
<i>Diaspis</i>	72
<i>Aulacaspis</i>	73
<i>Leucaspis</i>	74
<i>Hemichionaspis</i>	75
<i>Chionaspis</i>	75
<i>Parlatoria</i>	78
<i>Fiorinia</i>	79
<i>Mytilaspis</i>	80
<i>Poliaspis</i>	82
III. LIST OF COCCIDÆ RECORDED FROM JAPAN, NOT INCLUDED IN THE FOREGOING LIST.....	83
EXPLANATION OF PLATES.....	86

I. INTRODUCTION.

THE Coccidæ (Scale Insects) described and identified in this paper were collected by the author in Japan in the summer of 1900, between June 6th and August 25th. This collecting expedition was made partly on behalf of Stanford University, and partly as the personal undertaking of the author. Collections were made on all of the main islands of the Empire, excepting Shikoku; but as the time was limited, only the principal agricultural districts of each island could be visited, although it was sometimes possible to penetrate into the wild forests when situated conveniently near the railways. The writer was not able to reach several important places in the southern part of Kiushiu Island and in Sanin and Hokurikudo of Hondo (Honsu), nor could Formosa be visited. As special attention was being paid to the distribution of the San Jose Scale in Japan, as well as to collecting generally, it was especially important that most of the time be spent in horticultural districts. An examination of the wild lands of the Empire will reveal many species of Coccids not included in this collection.

In this paper are listed seventy-six species collected on this expedition, twenty of which are described as new, while three more are described as new varieties. These new species and varieties are described under the following names:—

Monophlebus corpulentus.

Sasakia quercus.

Kermes nakagawæ.

Kermes nawæ.

Eriococcus japonicus.

Rhizococcus onukii.

Dactylopius comstocki.

Dactylopius pini.

Dactylopius kraunhiæ.

Pulvinaria horii.

Pulvinaria oyamæ.

Pulvinaria hazeæ.
Lecanium takachihoi.
Aspidiotus cryptomeriæ.
Aspidiotus jordani.
Aspidiotus kelloggi.
Leucaspis bambusæ.
Chionaspis colemani.
Chionaspis hikosani.
Fiorinia fioriniæ var. *japonica.*
Mytilaspis pomorum var. *japonica.*
Mytilaspis euryæ.
Mytilaspis newsteadi var. *tokionis.*

In addition to the seventy-six species of the author's own collecting is appended a list of all other Coccidæ found recorded from Japan; this list includes forty species, making a total of one hundred and sixteen species so far found in Japan. Of these species, seventy-one (including the twenty species published in this paper) were originally described from Japanese specimens.

The references given with each species are to the original description of the species, and to its occurrence in Japan.

For courtesies extended, the thanks of the author are due Hon. Shiro Fujita and Mr. Tsuneaki Sako, of the Department of Agriculture and Commerce of Japan; to Director J. Sawano and Mr. Suguyo Hori of the Nishigahara Agricultural Experiment Station, Tokyo, for kindly allowing the use of the laboratory; and also to many others for assistance given.

This opportunity is also taken to express sincere thanks to Professor T. D. A. Cockerell of East Las Vegas, New Mexico, and to Mr. Alexander Craw, Quarantine Officer, State Board of Horticulture, San Francisco, for much valuable information concerning Japanese Coccids. To Dr. L. O. Howard and his assistants, Messrs. C. L. Marlatt, Theo. Pergande, and J. Kotinsky, of the Division of Entomology, U. S. Department of Agriculture, the author is under great obligations for assistance in the determination of material.

This paper was prepared in the Entomological Laboratory of Stanford University, under the direction of Professor V. L. Kellogg.

II. DESCRIPTIONS OF NEW SPECIES AND IDENTIFICATION OF OLD SPECIES.

Family COCCIDÆ.

Subfamily MONOPHLEBINÆ.

Genus *Monophlebus* Leach.

1. *Monophlebus burmeisteri* (?) Westwood.

Monophlebus burmeisteri WESTWOOD, Arcana Entom., 1841, 1, 22, 4.
SIGNORET, Essai, 1875, p. 364. MASKELL, Trans. & Proc. New Zealand Inst., Vol. XXIX, 1896, p. 327.

Four specimens of this species were found by the author in Hikosan, Kiushiu. The name of the host is unknown. Previous to this A. Koebele had found it on *Pinus* sp., in Yokohama.

2. *Monophlebus corpulentus*, sp. nov.

PLATE VII, FIGS. 1-3.

Adult Female.—Color brownish, legs and antennæ black, thinly covered with a white cottony secretion which is thicker on the ventral aspect. Elliptical in form, thick, segments distinct. Size of the largest specimen 16 mm. long, 7 mm. wide. When examined with compound microscope the skin shows a dense pubescence of short and long hairs, and many round pits. Antennæ nine-segmented, 1.6 mm. long; formula, 9, 5, (1, 2, 4, 6, 3) (7, 8); each segment bearing several rather long hairs. The measurements of the antennal segments are as follows:—

	1	2	3	4	5	6	7	8	9
<i>Length</i> ..	133	166	183	166	200	166	150	150	200
<i>Width</i> ...	466	250	200	200	200	166	133	133	150

Rostral loop long; mentum conical, dimerous. Legs subequal, stout; anterior pair smaller than posterior pairs; coxa wider than long; trochanter triangular in shape; femur very thick, outer margin convex, shorter than

tibia; tibia more than twice as long as tarsus; inner margin of tibia and tarsus bearing several strong spiny hairs; all segments with many hairs; claw large, with one to four spine-like digitules on its inner margin. Anal ring hairless.

Found by the author on the trunk of *Quercus* sp. in the grounds of Nishigahara Agricultural Experiment Station, Tokyo.

This species is related to *Monophlebus burmeisteri* Westwood, but may be readily distinguished from the latter by its great size, legs much thicker and stouter, femur comparatively short.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Icerya* Sign.

3. *Icerya* sp.

Two specimens were obtained by the author in Mr. Yafune's orange orchard, Arita-gun, Yakayamaken. Not being in a good condition the species could not be determined.

Subfamily MARGARODINÆ.

Tribe *Xylococcini*.

Sasakia, gen. nov.

Adult female with nine-segmented antennæ; body distinctly segmented, mouth-parts wanting in the adult stage; no digitule on claw nor on tarsus; anal tube absent; enclosed in a cottony secretion.

Larva with six-segmented antennæ; anal tube wanting.

4. *Sasakia quercus*, sp. nov.

PLATE VII, FIGS. 4-8.

Adult Female.—The adult female is usually found in crevices on bark, in a white cottony secretion. Color red; antennæ and legs reddish brown. Length 1.85 mm., width about 1 mm.; subelliptical, narrower toward anterior. Antennæ close to each other, very stout, nine-segmented, constricted at base of each segment, about .5 mm. long; formula, 1, 9, (2, 3, 4, 5, 6, 7, 8); segment 1 very stout and long; segments 2 to 8 subequal; short hairs on each segment. Legs subequal, very stout; coxa stout, as wide as long.

trochanter large; femur very stout, outer margin very convex; tibia as long or longer than femur, with at least six knobbed hairs, and many spines at the posterior end; tarsus less than half as long as tibia; outer margin convex, inner margin concave, and bearing four or more spiny hairs; claw very stout and curved; no digitules on claw nor on tarsus; anal tube wanting. There are small round pits on the dorsum.

Intermediate Stage.—Length 1 mm., width .7 mm.; suboval, slightly narrower toward anterior; color red. Antennæ and legs wanting; mouth-parts prominent; rostral loop long.

Newly Hatched Larva.—Length about .2 to .25 mm.; elliptical in outline, narrower toward anterior end. Color red; antennæ and legs pale. Eyes round and prominent. Antennæ very large, club-shaped, and close together; six-segmented; formula 6, 1, 3, 4, 5, 2; segment 6 very much the longest, as long as all the others together; segment 1 next to the longest and very broad; segment 2 shortest; each bearing a few hairs. Mouth-parts very large; rostral loop long. Legs subequal; coxa wider than long; femur stout; tarsus short; digitules fine hairs; claw, long and slender. Posterior end of the body with two long hairs and a few very fine scattered hairs. Margin of body with capitate hairs. Anal tube wanting.

This species was found by the author on *Quercus myrsinæfolia* (Shira-gashi) and *Quercus acuta* (Katagi), in Tokyo, and on *Quercus acuta* in Chikujo-gun, Kiushiu.

“The absence of the anal tube in younger stages allies it with certain species of *Calostoma*” (Pergande).

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Subfamily COCCINÆ.

Tribe *Asterolecanium*.

Genus *Lecaniodiaspis* Targ.

5. *Lecaniodiaspis quercus* Ckll.

Lecaniodiaspis quercus COCKERELL, Psyche, Supp., 1896, p. 19; Bull. T. S. No. 4, Div. Ent., U. S. Dept. Agric., 1896, p. 51.

This species was found by the author on *Quercus acuta* (Katagi), *Pasarnia glabra* (Matera-shii), and *Q. sessilifolia* (Tsukubane-gashi) in Tokyo, and *Q. acuta* in Chikujo-gun, Kiushiu. It was originally described by Cockerell from specimens sent to the Division of Entomology, U. S. Department of Agriculture, by O. Takahashi, Tokyo.

Tribe *Kermesini*.Genus *Kermes* Boilard.6. *Kermes nakagawæ*, sp. nov.

PLATE VII, FIGS. 9-15.

Adult Female.—Length 4 to 5 mm., width 5 to 6 mm., height 3.5 to 4 mm. Color dark brown with black transverse markings; covered with waxy, grayish white secretion. A broad median longitudinal groove; in the groove near the base is a round protrusion which usually has a grayish white flake on each side. Antennæ very small, about .1 mm. long, three-segmented; formula 3, 2, 1; segment 3 much the longest, longer than 1 and 2 combined; last segment bearing four or five long hairs. Legs vestigial, only three parts being apparent; claw large, curved; one pair of digitules.

Newly Hatched Larva.—Length 4 mm., width .2 mm.; oval in shape. Color pinkish; antennæ and legs pale brown. Mouth-parts large, well-formed; rostral loop long. Antennæ short, only .1 mm. long, six-segmented; formula, 6 (3, 2, 1) (5, 4); segment 6 longest; 4 shortest; segment 1 stoutest. Legs short and stout; tibia and tarsus about equal in length; tarsal digitules fine and knobbed, digitules on claw short and stout; claw large, curved, and denticulate on its inner side. Margin of body with capitate hairs; two rows of capitate hairs on thoracic and abdominal segments. Ventral aspect with five rows of fine hairs. Caudal lobes terminated with a long hair; three spines behind the anal opening.

This species was found by the author on the trunk of *Quercus serrata* (Kunugi) in Akabane, *Quercus* sp. in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo, and on *Q. glandulifera* (Nara) at Hikosan, Kiushiu. The scales are usually found in groups, and are badly infested by parasitic hymenoptera.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

7. *Kermes nawæ*, sp. nov.

PLATE VIII, FIGS. 16-22.

Adult Female.—Length about 6.5 mm., width 7 mm., height nearly 5 mm., globose in outline. Color shining chestnut brown; dorsum with five black transverse markings; no longitudinal groove; thinly covered with white powder. When taken off, the specimens leave some of the white cottony substance on the tree. Antennæ and legs very small. Antennæ consist of five segments, .16 mm. long; formula, 3, 4, 5, 2, 1; segment 3 the longest; terminal segment bearing several rather long hairs; the others a few short ones. Mouth-parts well developed; mentum very large, conical,

dimerous. Legs subequal; coxa stout, not very much shorter than femur; trochanter small, triangular, with two spines; tarsus longer than tibia; tarsal digitules fine and knobbed, digitules on claw short and stout; claw large, with a minute denticle on its inner margin.

Newly Hatched Larva.—Length .6 mm., width .3 mm.; elliptical in form; color pale brown. Antennæ and legs very large, well developed. Antennæ six-segmented; segment 6 the longest; segments 1 to 5 with a few hairs; segment 6 bearing many rather long hairs; formulæ:—

6, 1, 3, 2, (4, 5).

6, 3, (2, 1) 4, 5.

6, (1, 3) (2, 4, 5).

6, 3, 1, (2, 4, 5).

6, (3, 1) (4, 5) 2.

Mouth-parts very large; rostral loop longer than body; mentum large and conical. Margin of body with conspicuous, spiny hairs. Two capitate hairs on submargin close to first spiracle. Legs subequal; tibia about one-half as long as tarsus; four fine hair-like digitules; claw slender, denticle on its inner margin. Ventral aspect of body with transverse rows of fine hairs; posterior end of body furnished with lobes, each terminated by a long hair, and three spines, two on inner side of the hair and one on the outside. Anal ring hairless.

This species was found by Mr. Nawa on *Quercus glandulifera* (Nara) in Fukui-ken, and by Mr. A. Onuki, on *Rhamnus japonica* var. *genuina* (Kuro-umemodoki) in Nagano-ken.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Tribe *Eriococcini*.

Genus *Eriococcus* Targ.

8. *Eriococcus graminis* (?) Mask.

Eriococcus graminis (?) MASKELL, Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 243.

This species was found on bamboo, in Gifu-ken. The original description was made by Maskell from specimens sent to him by A. Koebele, who had found them on grass in Hongkong.

9. *Eriococcus japonicus*, sp. nov.

PLATE VIII, FIGS. 23-25.

Adult Female.—Female sac, length about 1.7 mm., width about 1 mm.; convex, elliptical; color pale straw.

Female, length about .65 mm., width .4 mm.; oval in outline, anterior end narrow, segments distinct. Antennæ five-segmented, about .1 mm. long; formula, 5, 3, 1, 2, 4; segment 5 longest; 4 shortest; segment 6 with many hairs; the others with few. Anterior pair of legs smaller than posterior pairs; coxa large; trochanter very small, bearing a long hair; femur stout, convex on both sides; tarsus longer than tibia; claw large, curved; digitules on tarsus long and fine, digitules on claw stout and short. Coxa of second and third pairs of legs very large, almost as long as femur. Margin of body with spines; each abdominal segment with a transverse row of strong spines; spines on thorax not in a row. Posterior end of body furnished with two lobes, each bearing a long hair and a few spines. Anal ring prominent, and bears six hairs.

Eggs.—Length .4 mm., width .25 mm.; elliptical; brown in color.

Male Coccoon.—Length .7 mm., width .3 mm.; elliptical; same color as the female sac.

This species was found by the author on *Symplocos myrtacea* (Hainoki) in Chikujo-gun, Kiushiu.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

10. *Eriococcus onukii*, sp. nov.

PLATE VIII, FIGS. 26-28; PLATE IX, FIGS. 29-33.

Adult Female.—Female sac, length about 3.5 mm., width 2 mm.; strongly convex, suboval in outline, usually with five transverse ridges on the dorsum, but sometimes only four. Color of the sac white inclining to grayish.

Female reddish brown. When boiled in KOH turns red; spread out under cover-glass measures 2.5 to 3 mm. in diameter; dorsum with strong spines, ventral aspect bearing many fine scattered hairs. Mouth-parts well formed, rostral loop short. Antennæ seven-segmented, .23 mm. long; segment 1 stout and shortest; segment 3 longest, but not much longer than 4; terminal segment with several long hairs, the others with a few short ones; formulæ:—

$$\begin{array}{l} \left. \begin{array}{l} 3, 4, 7, 2 \ (5, 6) \ 1 \\ (3, 4) \ 1, 7, 2, 6, 5 \end{array} \right\} \text{one specimen.} \\ \left. \begin{array}{l} (3, 4, 7) \ 2 \ (5, 6) \ 1 \\ (3, 4) \ 7, 2 \ (5, 6) \ 1 \end{array} \right\} \text{one specimen.} \\ \left. \begin{array}{l} (2, 3, 7) \ (4, 5) \ 6, 1 \\ 3, 7, 2, 4 \ (5, 6) \ 1 \end{array} \right\} \text{one specimen.} \end{array}$$

Legs as usual, subequal; coxa large, stout, longer than wide, bearing a few spines; trochanter rather large, subtriangular, with two long and one short spiny hair; tibia shorter than tarsus, with two spines on inner margin of posterior extremity; tarsus slightly tapering toward end; tarsal digitules long, knobbed, and hair-like, digitules on claw short, slightly extending beyond

claw; claw large, well curved, with denticle on its inner margin. The posterior end of the body is furnished with lobes, each terminated by a long hair and a spine. Anal ring very prominent, with eight hairs.

Egg.—Length .3 mm., width .17 mm.; oval in shape; color pale brown.

Newly Hatched Larva.—Length .41 mm., width .2 mm.; long, elliptical in form, very much like that of *Gossyparia ulmi*. Antennæ six-segmented, .1 mm. long; formula, 3, 6, 2 (1, 4, 5); segment 3 longest; segment 1 stoutest; segment 6 with many long hairs; the others with a few. Mouth-parts large; rostral loop reaching to the fourth abdominal segment. Legs subequal, large; tibia very much stouter than tarsus; tarsal digitules fine and knobbed, digitules on claw short, extending only slightly beyond claw. Margin of body with very strong spines; dorsal aspect of thoracic, and first two abdominal segments, with two spines. Abdomen tapering toward posterior extremity, and furnished with lobes, each bearing long hairs and two spines. Anal ring with six hairs.

This species was found by the author on *Arundinaria hindsii* var. *graminæ* (Kanzanchiku) in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Gossyparia*.

11. *Gossyparia ulmi* Geoff.

Gossyparia ulmi GEOFF. SIGNORET, Essai, 1875, p. 21. HOWARD, Insect Life, Vol. II, 1890, p. 34. COCKERELL, Proc. Phil. Acad., 1899, p. 268. *Gossyparia spuria* MODEER.

This species was found by K. Oyama, on *Ulmus* sp., in Nagano-ken. It differs, however, from the specimens found on Stanford University campus in having the body of the adult female entirely covered by the waxy secretion. Microscopic characters show no difference.

Tribe *Dactylopiini*.

Genus *Dactylopius* Costa.

12. *Dactylopius comstocki*, sp. nov.

PLATE IX, FIGS. 34 AND 35.

Adult Female.—Length 4 mm., width 2 mm.; long oval in outline, slightly narrow in front. Dark purple in color; antennæ and legs brown; body dusted with white powder.

When boiled in KOH the color is purple. Antennæ eight-segmented, .5 mm. long; segment 8 longest; 3 next in length, but not much longer than 2; segment 8 bearing many hairs; the others a few; formulæ:—

8, 3, 1, 2, 5, 6, 7, 4.
 8 (3, 2) 1, 7, 5, 6, 4.
 8, 2 (3, 1) 5, 4, 7, 6.
 8 (2, 3) 1, 5, 4, 6, 7.
 8 (2, 3, 1) 5, 6, 4, 7.
 8 (2, 1) 3, 5, 4 (6, 7).

The measurements of the antennal segments vary as follows:—

	1	2	3	4	5	6	7	8
1	47	53	50	27	33	36	36	94
2	41	53	47	22	25	27	33	91
3	44	66	55	36	41	41	44	108
4	44	55	53	39	39	39	44	111
<i>Ave.</i>	44	56	51	31	34	34	39	101

Mouth-parts large; rostral loop long. Spiracles large. Legs normal; coxa longer than wide, with several spines; trochanter as usual, bearing one long and a few short hairs; femur thick, outer margin convex, with many scattered hairs; tibia as long as femur, tapering posteriorly, with many hairs; tarsus about one-third as long as tibia, tapering posteriorly, with many hairs; tarsal digitules fine and knobbed, digitules on claw short, gradually widening into large knobs. Dorsum with fine scattered hairs and round pits. Posterior end of body furnished with lobes, each bearing a fine long hair and two stout spines. Anal ring round, prominent, with six hairs.

Found at Akabane by the author in cracks or crevices of trunk of mulberry-tree (Kuwa), near the ground, and protected by a covering made by ants. The ants and scales associate in the chamber, being mutually benefited. It was also found in the crevices of the trunk of a kind of maple in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo.

This species is related to *Dactylopius theobromæ* Dougl. The two species may be separated by the following table:—

Dactylopius comstocki.

Segment 8 of antenna very much shorter than 5, 6, and 7 together.

Tarsi one-third length of tibiae; claw rather long and large.

Dactylopius theobromæ.

Segment 8 of antenna equal to 5, 6, and 7 together.

Tarsi half the length of tibiae; claw short.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

13. *Dactylopius pini*, sp. nov.

PLATE IX, FIGS. 36-38.

Adult Female.—Found among growing needles of pine. A white cottony secretion covers all the body. Color, reddish brown; legs and antennæ brown. When boiled in KOH the color turns purple. Length about 4 mm., width about half the length. Margin of body with fine simple hairs; dorsum with fine hairs and minute round pits. Antennæ eight-segmented, .4 to .5 mm. long, hairy; segment 8 always longest; 4 usually shortest; segments 2 and 3 subequal. The following formulæ show the variations in the relative lengths of the antennal segments:—

8, 2, 3, 1 (6, 7) 5, 4.

8, 2, 3, 1, 7, 6, 5, 4.

8, 2, 3 (1, 7) (5, 6) 4.

8, 2, 3 (1, 7) (4, 5, 6).

The measurements of the antennal segments vary as follows:—

	1	2	3	4	5	6	7	8
1	83	75	88	47	55	53	50	111
2	80	83	83	47	55	47	53	108
3	72	77	72	53	58	44	47	111
4	77	80	80	53	64	50	47	116
5	75	75	75	47	55	50	41	105
6	77	77	72	53	64	44	44	111
<i>Ave.</i>	77	77	78	50	58	45	47	110

Mouth-parts as usual; rostral loop long. Legs round; coxa short, wider than long; trochanter triangular, with one long and two or more short hairs; femur large, outer margin convex; tibia not so stout as femur, but almost equal to it in length; tarsus less than half the length of tibia; segments with many

projecting hairs; tarsal digitules long, fine, knobbed, and hair-like; digitules on claw quite stout and short, extending a little beyond claw; claw thick, curved. Anal ring round, prominent, with six hairs. Caudal hairs short, with two strong spines.

Newly Hatched Larva.—Larva taken from the female is oval in shape; length about .35 mm., half as wide as long. Antennæ five-segmented, about $\frac{1}{3}$ mm. long; formula, 5, 3, 2, 1, 4; segment 5 longest; 4 shortest; terminal segment with many prominent hairs; others with comparatively few. Margin of body with fine simple hairs. Legs large and subequal. Posterior end of body furnished with prominent lobes, each bearing a long hair with two stout spines at the base. Anal ring distinct, with six hairs.

Found by the author on *Pinus* sp. in Koishiwara, Kiushiu, and on *Pinus pentaphylla* (Goyo-matsu) in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo.

This new species is closely allied to *Dactylopius sequoia* Coleman, but they may be separated by the following table:—

<i>Dactylopius pini</i> .	<i>Dactylopius sequoia</i> .
Female enclosed in a sac.	Female not enclosed in a sac.
Female with no egg-sac on the caudal ventral aspect.	Female with egg-sac on the caudal ventral aspect.
Female gives birth to young.	Female lays eggs.
Antennæ of young five-segmented.	Antennæ of young six-segmented.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

14. *Dactylopius kraunhiæ*, sp. nov.

PLATE IX, FIGS. 39 AND 40.

Adult Female.—Enclosed in a cottony sac, of irregular shape; color reddish brown. When boiled in KOH and spread out under cover-glass measures about 2 mm. in length and 1.5 mm. in width; broad elliptical in form. A transverse row of spines on the dorsal aspect of each segment; ventral aspect with fine hairs; dorsum covered with small round pits. Antennæ and legs large, brown in color. Antennæ eight-segmented, .5 mm. long, hairy; formula, 8, 3, 2, 1, 5 (4, 6, 7); the measurements of each antennal segment, (1) 69–69; (2) 77–80; (3) 83; (4) 55; (5) 56; (6) 53; (7) 55; (8) III; segment 6 slightly longer than 3; segment 3 slightly longer than 2; segments 4, 5, 6 and 7 subequal; segment 1 stoutest. Mouth-parts comparatively large; rostral loop long, extending down to the first or second abdominal segment. Legs subequal, hairy; coxa much wider than long; trochanter as usual, bearing a few spiny hairs; femur thick, outer margin convex; tibia slightly shorter than

femur and three times as long as tarsus; tarsal digitules fine and knobbed, digitules on claw stout, short, and knobbed; claw as usual, curved. Each of the marginal lobes of the posterior segment bears a single long hair, with two spines at the base. Anal ring large, prominent, with six hairs.

This species was found by the author on *Kraunkhia floribunda* (Fuji) at the Yokohama Nursery, Yokohama.

This is allied to *D. pini* Kuwana, but the body of the former is shorter and more stout, the legs and antennæ larger in proportion to the body, and segment 8 of the antenna is as long or not quite so long as 6 and 7 together, while 6 is not much longer than 3.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Phenacoccus* Ckll.

15. *Phenacoccus pergandei* (?) Ckll.

Phenacoccus pergandei COCKERELL, Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 55.

This species was found by the author on *Diospyros kaki* (Kaki) in Kusatsu, Shiga-ken. The specimens are in a poor condition.

Genus *Sphærococcus* Mask.

16. *Sphærococcus parvus* Mask.

PLATE IX, FIG. 41.

Sphærococcus parvus MASKELL, Ent. Mon. Mag., Vol. XXX, 1897, p. 244; Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 247.

This species was found by the author on the trunk of a cherry-tree in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo. Previous to this it had been found for the first time by A. Koebele, on a cherry-tree in Japan (the locality not mentioned), and described by Maskell as a new species.

Mr. Maskell evidently made a mistake when he considered the antennæ of the newly hatched larvæ to be composed of six confused segments. They are distinctly

three-segmented¹, about .23 mm. long; formula, 3, 1, 2. Anal ring of larva with six hairs. Antennæ of female appear to be two-segmented. Maskell's statement in regard to the anal ring being without bristles is erroneous. There are six small bristles or hairs.

Genus *Antonina* Sign.

17. *Antonina crawi* Ckll.

Antonina crawi COCKERELL, Psyche, Vol. IX, 1900, p. 71.

Newly Hatched Larva.—Length .4 mm., width .2 mm.; oval in shape; purple in color. Antennæ six-segmented, about .14 mm. long; formula, 6 (5, 4, 2) (1, 3); segment 6 much the longest; 2, 4 and 5 subequal; 3 shortest; segment 6 with many long hairs. Three pairs of legs subequal; tibia shorter than tarsus; claw slender and rather long; four digitules, lower pairs very stout. The dorsum covered with small round pits. Caudal end of abdomen bears two long hairs. Anal ring prominent, with six hairs.

This species was found by the author at the sheathing bases of leaves of different kinds of bamboo, in different places in Japan: on *Phyllostachys nigra* (Kuro-chiku), *Phyllostachys quilioi* (Madake), and on *Arundinaria simoni* (Narihira-dake) in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo, on Madake in Akabane, and on many kinds of bamboo in Kiushiu. Sometime before this it had been found on bamboo from Japan by A. Craw, in quarantine work at San Francisco.

Genus *Pseudolecanium* Ckll.

18. *Pseudolecanium tokionis* Ckll.

Pseudolecanium tokionis COCKERELL, Psyche, Supp., 1896, p. 16; Bull., No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 49; Psyche, Vol. IX, 1900, p. 71. KUWANA, Proc. Cal. Acad. Sci., 3d Ser., (Zool.) Vol. II, 1901, p. 403.

This species was found by the author on bamboo in the vicinity of Tokyo, and on the same host in Gifu-ken. It

¹ Mr. Pergande, who examined the author's specimen, says the antennæ consist of four segments.

was originally described by Cockerell from dry specimens sent to the Division of Entomology, U. S. Department of Agriculture, by O. Takahashi, Tokyo. In 1899 the author found it on bamboo on the Stanford University campus, and the male in different stages was described by him.

Subfamily LECANIINÆ.

SERIES I.

Genus *Pulvinaria* Targ.

19. *Pulvinaria psidii* Mask.

PLATE X, FIG. 42.

Pulvinaria psidii MASKELL, Ent. Mo. Mag., Vol. XXXIII, 1897, p. 243;
Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 242.

This species was found by the author on *Diospyros kaki*, in Gifu-ken, on Tsuta in Hikosan, Kiushiu. A. Koebele had also found it on *Citrus*, *Pittosporum* and *Eurya japonica*, in Japan.

20. *Pulvinaria aurantii* Ckll.

PLATE X, FIG. 43.

Pulvinaria aurantii COCKERELL, Psyche, Supp., 1896, p. 19; Bull., No. 4,
T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 48.

Newly Hatched Larva.—Length .4 mm., width .21 mm.; suboval; abdominal cleft distinct. Rostral loop long. Antennæ and legs large, well developed. Antennæ six-segmented; formula, (6, 3) 1, 2, 4, 5. Three pairs of legs subequal; tibia and tarsus about equal in length. Margin of body with fine simple hairs. Anal plates conspicuous, each with a very long hair.

This species is one of the worst pests in the orange orchards. It occurs in almost every part of the Empire. The author collected it in the following places: on orange in Kokura, Chikujo-gun, Kato-mura, and Hukuoka City, in Kiushiu, and in Wakayama-ken, Kiyoto, Osaka, Gifu-ken, Aichi-ken, Tokyo, and Yokohama, in Hondo. It was also found on *Eurya ochracea* (Sakaki), in Chikujo-gun, Kiushiu, and on tea-plant in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo.

21. *Pulvinaria horii*, sp. nov.

PLATE X, FIGS. 44-52.

Adult Female.—Found usually in crevices of bark or in any sheltered place on trunk and large limbs, singly and in clusters. Color pale brown. The scale is circular, with many short lines radiating from the margin toward the center; in the center two longitudinal lines are bordered by two transverse lines, forming a quadrangle with a much raised longitudinal median line. The scale is not covered with secretion. Ovisac snow white, its base ranging from 4 to 5 mm.; ovisac extending posteriorly and laterally, with many distinct, radiating grooves, as shown in the figure; the posterior end of scale distinctly cleft. When boiled in KOH and spread out under a cover-glass measures about 8 mm.; circular in outline; abdominal cleft deep. Antennæ eight-segmented, .41 mm. long; formula 2 (3, 4, 5) 6, 7, 8, 1; segment 2 longest; 3, 4, and 5 subequal and next in length; segment 1 stoutest and shortest; segment 8 with many long hairs; the others with few. Mouth-parts small; rostral loop short. Margin of body with fine simple hairs; each anterior incision has a long spine with a short one on each side. Legs subequal; coxa longer than wide, with two or more spines; trochanter the usual shape but small, with one long and a few short hairs; femur, the longest segment of the leg, is as wide as coxa and bears a few spines; tibia slender, almost as long as femur; tarsus less than half the length of tibia, with four digitules and a terminal claw; tarsal digitules fine and knobbed, digitules on claw stout and knobbed; claw large and curved. Triangular plates small but conspicuous, several spiny hairs along posterior portions. Anal ring large, bearing many (eight ?) long hairs.

Newly Hatched Larva.—Length .66 mm., width .4 mm.; broadly elliptical, front rounded, widest in thoracic regions. Color reddish brown; legs and antennæ pale brown. Eyes red and distinct. Margin of body with fine simple hairs, rather far apart; in each anterior incision is a long spine with a short one on each side. Mouth-parts large; rostral loop extending to about the third abdominal segment. Antennæ and legs large. Antennæ usually seven-segmented, .2 mm. long, hairy. The proportional lengths of antennal segments are variable even in the same specimen, but segment 3 is always the longest. The following formulæ show the variations:—

3, 7 (2, 6) 5, 4, 1.
 3, 7, 2, 4, 5, 6, 1.
 3, 6, 4, 5, 2, 1.
 3, 6 (4, 5) 2, 1.
 3, 4, 7, 5, 2, 6, 1.
 3 (4, 5) 6, 2, 1.
 3, 8, 2, 5 (4, 6, 7) 1.

Three pairs of legs subequal, anterior pair slightly smaller than the posterior pairs; coxa quite large, longer than wide, with a few hairs; trochanter small and triangular, with one long and a few short hairs; femur the largest segment of leg, and as wide as coxa; tibia shorter than femur, with a few spiny hairs along outer margin; tarsus much shorter than tibia, tapering posteriorly, and

furnished with spiny hairs on outer margin; four digitules and a large curved claw at posterior extremity; tarsal digitules fine and knobbed. Caudal end of the body deeply cleft; triangular plates very large, with a long hair and a few fine spines at their posterior margins. Anal ring prominent, with six long hairs.

This species was found by the author on the trunks of *Acer trifidum* (To-kæde), *Æsculus turbinata* (Tochino-ki), and *Kœlreuteria paniculata* (Mokugenji), in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo; it is named in honor of S. Hori, Entomologist of the Station.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

22. *Pulvinaria oyamæ*, sp. nov.

PLATE XI, FIGS. 53-56.

Adult Female.—A cottony mass suboval in form, there being at the narrower end a dark brown scale sometimes flattened, and sometimes bent upward at about its middle to nearly a right angle; oval, slightly broader behind, where it is notched and apparently cleft for a short distance in the middle. Dorsum with five or six transverse wrinkles or folds, and many raised lines running outwardly on each side to the posterior margin. Length of sac 6 mm., width about 4 to 5 mm., snow white, no distinct groove; scale dark brown.

When boiled in KOH and spread out under cover-glass, measures about 5 to 7 mm. in length and 4 to 5 mm. in width. Mouth-parts well chitinized but small; rostral loop short. Antennæ usually 8-segmented, terminal segment bearing many long hairs, the others a few; relative lengths of antennal segments are variable, but segment 3 is longest, as may be seen in the following formulæ:—

3, 5, 2, 4, 1 (6, 7, 8).

(3, 2, 4) 5, 6, 8, 7, 1.

(3, 4) 2, 5 (6, 7, 8) 1.

Legs subequal; coxa stout, longer than wide, with a few long spiny hairs; trochanter as usual, with one long hair; femur stout, with a few scattered hairs; tibia shorter and smaller than femur, with several long hairs on the inner margin and weak hairs on the outer margin; tarsus one-half as long as tibia, with spiny hairs; tarsal digitules long, fine, and knobbed, digitules of claw very stout, gradually widening to large knobs; claw large and curved. Margin of body with spiny hairs, in each anterior incision is one large spine with a short one on each side. Anal plates as usual, posterior extremity rounded, with a few long hairs. Anal ring with eight prominent hairs.

This species was collected by K. Oyama, in Nagano-ken. The host is unknown.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

23. *Pulvinaria hazeæ*, sp. nov.

PLATE XI, FIGS. 57-59.

Adult Female.—Length with ovisac about 37 mm., width 5 mm.; ovisac white, without groove (the scales having been long exposed to weather the ovisacs were in so poor a condition that the texture could not be determined); scale, diameter 4.5 mm.; subcircular in outline; light brown in color.

When boiled in KOH and spread out under cover-glass, diameter about 6 mm. Antennæ eight-segmented, about .56 mm. long; formula, 3, 4, 2, 5, 8 (6, 7) 1; segment 3 much the longest; segment 1 stoutest and wider than long; the last segment bearing many long hairs. Mouth-parts small but well formed; rostral loop short. Anterior pair of legs smaller than the posterior pairs; coxa stout, longer than wide; trochanter the usual triangular shape, with one long spiny hair; femur large and as broad as coxa; tibia shorter than femur, with many long hairs; tarsus about one-third as long as tibia, with several spiny hairs; tarsal digitules long and knobbed, digitules of claw stout, gradually widening to large knobs; claw stout and curved. Margin of body with fine simple hairs; in each anterior incision is one large spine, with a short one on each side. Anal plates distinct, yellowish brown, with three or more rather long spiny hairs near posterior margins. Anal ring with six hairs.

Egg.—Length .3 mm., width .2 mm.; oval in shape; color brown.

This species was found by the author on the trunk of *Rhus succedaneæ* (Haze-no-ki) in Koishiwara, Chikujogun, Kiushiu.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Takahashia* Ckll.

24. *Takahashia japonica* Ckll.

Takahashia japonica COCKERELL, Psyche, Supp., 1896, p. 20; Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 47.

Egg.—Length .5 mm., width .3 mm.; elliptical in form; color pinkish brown.

Newly Hatched Larva.—Length .8 mm., width .35 mm.; elliptical in form; color brown; abdominal cleft distinct; margin of body with spiny hairs; anterior marginal incision with three subequal spines. Mouth-parts large; rostral loop reaching to about the third abdominal segment. Antennæ six-segmented; formula (6, 3, 5) (1, 2, 3). Legs rather large. Anal plates large, each bearing a long hair.

This species was found by the author on the mulberry-tree in Hukuoka, Gifu, Tokyo, and Sendai, and on other plants in Gifu and Saitama-ken.

SERIES II.

Genus *Ericerus* *Guer.*

25. *Ericerus pela* *West.*

Ericerus pela WEST, C. R. tome X, pp. 618-666; Revue Zoologique de Guérin-Meneville, 1830, p. 120; Gardeners' Chronicle, London, 1853, p. 532. SIGNORET, Essai, 1874, pp. 91, 92. SASAKI, Zool. Mag., Tokyo, Japan, No. 114, pp. 111-116. (In Japanese.)

This interesting insect has been known in certain parts of the Empire for years as producing wax. It is known to the people by the name of Ibota-mushi, because of its feeding on *Ligustrum ibota* or Ibota-no-ki. According to C. Sasaki, it has been recorded from Hukushima, Tottori, Nagano and Kochi-ken.

The author's specimens (male) were obtained from Y. Nawa, Gifu.

Genus *Ceroplastes* *Gray.*

26. *Ceroplastes floridensis* *Comstock.*

Ceroplastes floridensis COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 331.

This species was found by the author on oleander, in Wakayama-ken, and on the tea-plant in Tokyo and Yokohama. This is the first time it has been recorded from Japan.

27. *Ceroplastes ceriferus* *And.*

Ceroplastes ceriferus AND. MASKELL, Trans. & Proc. New Zealand Inst., Vol. XXV, 1892, p. 216. CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 44.

This species was found by the author on *Taonobo japonica*, (Mokkoku), in Minoshima, Wakayama-ken, and on the tea-plant in Kokura, Kiushiu. It is one of the worst tea-plant pests. In a plantation near Kokura the trees were

badly infested by this pest. Mr. Alexander Craw, San Francisco, found this insect on camellia, gardenia, and orange-trees from Japan.

SERIES III.

Genus *Lecanium Illig.*

28. *Lecanium (Saissetia) hemisphæricum Targ.*

Lecanium hemisphæricum TARG. COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 334.

This species was found by the author on *Phajus grandiflorus* (Kwaku-ran) and *Gardenia florida* (Kuchinashi) in the grounds of the Yokohama Nursery, Yokohama, and on *Schinus molle* and *Asparagus plumosus* in a green-house in Shinjiku, Tokyo. The insect was not found in the native woods. This is the first time it has been recorded from Japan.

29. *Lecanium (Eulecanium) takachihoi*, sp. nov.

PLATE XI, FIGS. 60-64.

Adult Female.—Length 6.5 mm., width 4 mm., height 4 mm., convex; dark brown in color; suboval, longitudinal carina distinct, anterior half of the scale much enlarged, gradually tapering posteriorly. Abdominal cleft distinct. The dorsum with irregular pits.

Under the compound microscope the skin shows hexagonal markings, and round, scattered, transparent pits. Antennæ seven-segmented, .5 mm. long; formula, 3, 4, 7, 6, 5, 2, 1; segment 3 not much longer than 4; segments 5 and 6 subequal; segment 1 shortest and stoutest; segments 1 to 6 with a few hairs; 7 with many long ones. Legs well developed; coxa longer than wide; trochanter as usual, with two hairs; femur convex on both sides, with two hairs on outer margin near posterior extremity; tibia a little longer than tarsus, with two hairs on inner margin near posterior extremity and one hair on the outer margin opposite the two; tarsus tapering posteriorly, and finished with a curved claw; tarsal digitules long and knobbed, digitules on claw short and stout. Anal plates rather small, with one or two spiny hairs at the posterior margin.

Newly Hatched Larva.—Length .58 mm., width .27 mm.; oval in shape; pinkish in color. Antennæ six-segmented, barely .2 mm. long; formula, 3, 6, 5, 1 (2, 4); segment 3 much the longest; segment 6 with many long hairs. Mouth-parts large; rostral loop reaching to about the third abdominal segment. Legs large; coxa stout and long; tarsus much shorter than tibia; tarsal digitules long, fine, and knobbed; digitules on claw short, small, and knobbed. One long and a few short hairs on the posterior end of each anal plate. Anal opening conspicuous, with six hairs.

This species was found by the author on a chestnut-tree, in Hikosan, Kiushiu, and is named in honor of N. Taka-chiho.

This scale is allied to *Lecanium pruinoseum*, but is not covered with white powder.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

30. *Lecanium rotundum* (?) *Réaumur*.

Lecanium rotundum (?) RÉAUMUR. SIGNORET, Essai, 1873, p. 428.

Two specimens were found by the author on the prune-tree, in Shinjiku, Tokyo.

31. *Lecanium* (*Calymnulus*) *hesperidum* L.

Lecanium (*Calymnulus*) *hesperidum* L. COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 335.

This species is a common green-house pest in Japan. The author found it on *Abutilon* sp., *Nerium odorum* (Kyochikuto), *Jasminum* sp., *Cycas revoluta* (Sotetsu), and *Eriobotrya japonica* (Biwa), in the green-house of the Agricultural College, Sapporo, Hokkaido, and on *Cercis chinensis* (Hana-zuo), in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo. The scales are commonly infested by parasitic hymenoptera. This is the first time it has been recorded from Japan.

32. *Lecanium* (*Saissetia*) *oleæ* Bernard.

Lecanium (*Saissetia*) *oleæ* BERNARD. COMSTOCK, Ent. Rept., U. S. Dept. Agric., 1880, p. 236; Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 40.

This species was found by the author on a lime-tree, in Kawasaki, near Tokyo. It is not at all common in Japan, in fact, it was not found in any other part of the Empire. A. Craw, in quarantine work, found it on deciduous magnolia from Japan some years ago.

33. *Lecanium*, sp.

PLATE XI, FIG. 65.

Of this scale but three female specimens were secured; one being infested by the hymenopterous parasites and another badly broken. The species could not be identified. Only the external characters will be given.

Female Scale.—Length 9 mm., width 9.5 mm., height 7.5 mm.; color dark shining brown, derm apparently thick; covered with white powder. Four raised cones on the dorsum. The scale, sloping toward the anterior end, has many raised, rather smooth ridges. The median groove distinct. The anal cleft deep.

This species was found by the author on *Kraunhia floribunda* (Fuji) in the grounds of the Yokohama Nursery, Yokohama.

Subfamily DIASPINÆ.

Genus *Aspidiotus* Bouché.34. *Aspidiotus inusitatus* Green.*Aspidiotus inusitatus* GREEN, Coccidæ of Ceylon, p. 49.

This species was found by the author on bamboo in Kokura, Kiushiu. This is the first time it has been recorded from Japan.

35. *Aspidiotus persearum* Ckll.*Aspidiotus persearum* COCKERELL, Entomologist, 1898, p. 240. CRAW, Rept. Calif. State Bd. Hort., 1897-98, p. 108.

This species was found by the author on *Trachycarpus excelsus* (Shuro) in Tarumi, Chikujo-gun, Kiushiu. Previous to this A. Craw found it in his quarantine work at San Francisco, on "Alligator pears" (*Persea gratissima*) from Honolulu, H. I. This is the first time it has been recorded from Japan.

36. *Aspidiotus secretus* Ckll. var. *lobulatus* Mask.

Aspidiotus secretus var. *lobulatus* MASKELL, Ent. Mon. Mag., Vol. XXXIII, 1897, p. 241; Proc. & Trans. New Zealand Inst., Vol. XXX, 1897, p. 224.

This species was found by the author on many kinds of bamboo in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo and Akabane. It has been recorded on *Bambusa* sp., (Miyanoshta) Japan, by A. Koebele.

37. *Aspidiotus trilobitiformis* (?) Green.

Aspidiotus trilobitiformis GREEN, Indian Mus. Notes, IV, p. 4.

This species was found by the author in a garden in Minoshima, Wakayama-ken. The name of the host is unknown. This is the first time it has been recorded from Japan.

38. *Aspidiotus duplex* Ckll.

Aspidiotus duplex COCKERELL, Psyche, Supp., 1896, p. 20; Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 52; Bull. No. 6, T. S., Div. Ent., U. S. Dept. Agric., 1897, p. 20. CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 33.

This species was found by the author on *Rhus succidanea* (Haze-no-ki) in Yukubashi, Kiushiu, on *Eurya ochracea* (Sakaki) in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo, and on *Thea japonica* (Tsubaki) in Yokohama. Originally described by Cockerell, from specimens sent to the Division of Entomology, U. S. Department of Agriculture, by O. Takabashi, Tokyo. A. Craw, San Francisco, also found this insect on the following plants from Japan: orange, camellia, azalea *Olea fragrans*, tea-plant, camphor, pæony, *Myrica rubra*, and rhododendron.

39. *Aspidiotus duplex* var. *pæoniæ* Ckll.

Aspidiotus duplex var. *pæoniæ* COCKERELL, Can. Ent., Vol. XXXI, 1899, p. 105.

This species appears to be a general feeder. It was found upon the following trees and plants: *Eurya ochracea*

in Hikosan; *Thea japonica* in Akabane; *Rhododendron indicum* var. *kämpferi* (Tsutsuji); *R. indicum* var. *macranthum* (Satsuki); *Ilex latifolia* (Taraya); *Clethra barbineros* (Ryobu); and *Thea sinensis* (Cha) in Tokyo. A. Craw, San Francisco, had previously recorded it on a pæony from Japan.

This scale is one of the worst pests of tea and ornamental plants. In many places the tea-plants were dying from the effects of the pest.

40. *Aspidiotus perniciosus* Comst.

Aspidiotus perniciosus COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 304. KUWANA, Cont. to Biol., The Hopkins Seaside Lab. of Leland Stanford Jr. Univ., No. XXV, 1901, pp. 1-14. SASAKI, Annot. Zool. Japan, Vol. III, 1901, pp. 165-173.

This scale was recorded by the author from many localities on the three main islands of the Japanese Empire: Kiushiu, Hondo and Hokkaido. On Kiushiu Island it was found on an old native pear-tree (about fifty years old), which was badly infested with the scale. The tree was standing alone at the back of a farm house, with no possible chance of its having come in contact with an infected tree. On the same island, near Kokura, was a pear orchard about five years old. The stock came from Tokyo, and was badly infested with the scale. In the spring of 1899 the owner dug up and burnt more than three hundred trees, but it was too late then, for the scale had already spread nearly all over the orchard. In Shiga-ken it was found on pear, apple, and quince trees in the grounds of the Agricultural Experiment Station. In Gifu-ken there are many small orchards, in every one of which the scale was found. In Tokyo it was found on pear-trees in the Mita Nursery and other places, on pear-trees in Kawasaki, and in Yokohama on pear-trees growing in a pot. In the northern part of Hondo the scale was found in orchards in Angio, Sendai, Morioka, Aomori, and Hirosaki; and in Hokkaido it was found in the apple orchard of the Agricultural College, Sapporo. Many of the trees were dying from the attack

of the scale. Since the author's return from Japan, Suguya Hori has written, saying that the scale has been found by him in some places in Hokurikudo. M. Nawa has also informed the author that he found it on nursery stock in Shikoku.

The scale was found upon the following hosts: pear, apple, peach, Japanese quince, currant, willow (*Salix gracilistyla*), *Pilea pumila*, *Pæonia moutan*.

The detailed data of this species are given in the author's report on "The San Jose Scale in Japan" (Contrib. to Biol. from the Hopkins Seaside Laboratory of Leland Stanford Jr. University, No. XXV, p. 1-14, 1901.).

41. *Aspidiotus ulmi* Johns.

Aspidiotus ulmi JOHNSON, Bull. Ill. State Lab. Nat. Hist., Vol. IV, 1896, p. 388; Entomological News, Vol. VIII, 1896, p. 152.

This species was found by the author on *Cycas revoluta*, in the grounds of the capitol of Hukuoka, and on two unknown hosts, one in Akabane and the other in the Nishigahara, Tokyo. This is the first time it has been recorded from Japan.

42. *Aspidiotus cydoniæ* Comst.

Aspidiotus cydoniæ COMSTOCK, Ent. Rept., U. S. Dept. Agric., 1880, p. 295.

This species was found by the author on fern (Kenchiyo) in the Yokohama Nursery, Yokohama. This is the first time it has been recorded from Japan.

43. *Aspidiotus lataniæ* Sign.

Aspidiotus lataniæ SIGNORET, Essai, 1868, p. 124.

This species was found by the author on *Abies firma* (Momi) in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo. Previous to this it had been found on tea-plant in Gifu, but this is the first time it has been recorded from Japan.

44. *Aspidiotus cryptomeriæ*, sp. nov.

PLATE XII, FIGS. 66-68.

Scale of Female.—The scale of the female is usually elliptical, flatly convex. Length 1.1 to 2. mm., width about 1. mm.; usual color grayish, sub-transparent. The exuviae are usually a little to one side of the center; straw color. The first skin usually shows the segmentation distinctly, length about .4 mm.; the second skin is more or less covered with secretion, length about .65 mm. Ventral scale a mere film applied to bark of plant.

Female.—The body of the mature female is rather flat, pale yellow, and oval in shape. The last segment is a little deeper yellow than the rest of the body, and presents the following characters:—

There are five groups of spinnerets. The anterior group contains four to five; the anterior lateral, seven to eight; the posterior laterals four to six. There are three pairs of well developed lobes. The first and second lobes of lateral side are abruptly narrowed toward their posterior extremities from about one-half their length; the third pair is much smaller than the first two pairs, and the lateral sides are sloping and very minutely serrulate. The plates are well developed; they are not much longer than the lobes, and are fringed; there are two small ones between the median lobes; those of each side are as follows,—two between the first and second lobes, three between second and third lobes, usually seven laterad of the third lobe. The spines are prominent; the first pair is situated near the lateral margin of the base of the first lobes, the second and third, about the middle of the bases of the second and third lobes; two or more spines laterad of the base of the third lobe.

Scale of Male.—The scale of the male is elongated, with the larval skin nearly central; color grayish, same as female in texture; larval skin straw color. Length about 1. mm., width .6 mm.

This species was found by the author on *Cryptomeria japonica* (Sugi) in Gifu-ken. It is allied to *Aspidiotus destructor* Sign., but the female scale of the new species is elliptical in form, and the exuviae in one side of the center, and the third pair of lobes of last abdominal segment of female is much smaller.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

45. *Aspidiotus jordani*, sp. nov.

PLATE XII, FIGS. 69-71.

Scale of Female.—The scale of the female is circular and flat; about 1.5 to 2.5 mm. in diameter. The general color of the scale is dingy brown,

conforming usually to the color of the under side of the leaves to which it is attached. The exuviae are in the center, and are covered with secretion. The first skin is a pale straw color, .4 mm. in length; second skin orange-yellow, .85 mm. long.

Female.—The body of the mature female is subcircular, usually from 1 to 1.5 mm. long, and .75 mm. wide; color brown. Presents the following characters:—

There are four groups of spinnerets. The anterior laterals vary from eleven to fourteen; the posterior laterals from seven to nine. There are three pairs of well developed lobes; the median pair commonly notched on the inner margin, sloping on the lateral margin, and very minutely serrulate; the second pair is smaller, and the third still smaller; the lateral margin of the second and third pair of lobes is sloping, and very minutely serrulate. The margin of the ventral aspect of the segment is deeply incised between the lobes. The parts of the body-wall forming the margin of these incisions are very much thickened. The plates are distinct, not longer than the lobes, fringed. There are two small ones between the median lobes; those of each side are as follows: two between the first and second lobes, three between second and third lobes, five or six laterad of the third lobe. The spines are prominent. The first, second, and third spines are situated near the lateral margin of the bases of the first, second, and third lobes; two more spines laterad of the base of the third lobe.

Scale of Male.—The scale of the male is circular, flat, and the same color as that of the female; about 1. mm. in diameter.

This species was found by the author on *Quercus* sp. Angio, Saitama-ken. The scale is extremely inconspicuous, as it lives beneath the epidermis on the under side of the leaf.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

46. *Aspidiotus (Chrysomphalus) aurantii* Mask.

Aspidiotus (Chrysomphalus) aurantii MASKELL, Trans. & Proc. New Zealand Inst., Vol. XI, 1878, p. 199. COCKERELL, Bull. No. 6, T. S., Div. Ent., U. S. Dept. Agric., 1897, p. 29.

This species was found by the author on a number of cultivated plants, namely: orange-tree and *Podocarpus chinensis*, in Wakayama-ken; on *Acacia* and the tea-plant in Yokohama; and on *Podocarpus chinensis* in Tokyo. Previous to this O. Takahashi, Tokyo, found it on *Podocarpus* in Japan.

47. *Aspidiotus (Chrysomphalus) ficus* Ashm.

Aspidiotus (Chrysomphalus) ficus RILEY & ASHMEAD, Amer. Ent., 1880, p. 267. CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 34. MASKELL, Proc. & Trans. New Zealand Inst., Vol. XXIX, 1896, p. 297; Ent. Mon. Mag., Vol. XXXIII, 1897, p. 241.

This species was found by the author on *Asparagus plumosus*, *Machilus thunbergii* (Inu-gusu), and Mango in Tokyo; on *Aspidistra lurida* and *Ligustrum japonicum* (Nezumi-mochi) in Yokohama. A. Craw, San Francisco, had previously recorded it on *Ilex latifolia* and *Aspidistra lurida* from Japan, and A. Koebele had also found it on *Quercus cuspidata* in Japan.

48. *Aspidiotus (Chrysomphalus) kelloggi*, sp. nov.

PLATE XII, FIGS. 72-74.

Scale of Female.—The scale of the female is circular, convex, with exuviae on one side of the center; the portion of the first skin is indicated by a nipple-like prominence which is coal black; the part of the scale covering the second skin is black; the remainder of the scale is brown, varying from a reddish brown to almost black. The scale measures 2 mm. to 3 mm. in diameter. The ventral scale is distinct; dark brown.

Female.—The body of the mature female is globose, pale yellow, the last abdominal segment is yellow, and presents the following characters:—

There are four groups of spinnerets. Anterior laterals vary from 11 to 17; the posterior laterals from 12 to 14. The number varies on opposite sides of the same individual. There are three pairs of well developed lobes; they are subequal, the lateral sides are sloping and serratulate. Plates distinct, small, shorter than lobes, fringed. Between the first pair of lobes are two small plates; between the first and second lobes of each side are two, and between the second and third lobes are three similar plates; one plate laterad of the third lobe. The body-wall is furnished with six thickenings on each side of the meson. These thickenings are long, somewhat club-shaped, the anterior part being enlarged and rounded. There is one terminating the base of each margin of each lobe. Those ending at the base of the lateral margins of the first lobes, and between the second and third lobes, are much longer than the others. There are three spines, one at the middle of the base of each lobe, and two more beyond the third lobe.

Found by the author in Higuma-yama, Chikujo-gun, Kiushiu. The name of the host is unknown.

This species is allied to *Aspidiotus sphaerioides* Ckll., but may be easily distinguished from that species by having only two pairs of spinnerets.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Diaspis* Costa.

49. *Diaspis pentagona* Targ.-Tozz.

- Diaspis patelliformis* SASAKI, Bull. Agric. College, Tokyo, 1894, pp. 107-124.
Diaspis amygdali TRYON. CRAW, Rept. Calif. State Board Hort., 1895-96, p. 38.
Diaspis amygdali var. *rubra* MASKELL, Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 228.
Diaspis amygdali WEBSTER, Can. Ent., Vol. XXX, 1898, p. 79 and Vol. XXXI, 1899.
Diaspis amygdali COOLEY, Can. Ent., Vol. XXX, 1898, p. 232.
Diaspis lanatus MORG. & CKLL. CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 29; and 1897-98, p. 106.

This scale insect is widely distributed, being found in nearly every province of Japan. It is the worst pest of the mulberry, fruit, and ornamental trees. In many places the mulberry-trees were dying from its effects. The insect generally attacks the lower part of the trunk, near the ground, although it often covers the entire surface of limbs and branches, as well as the trunk, and often can be seen from a great distance. It predominates in shady places which are not much exposed to sun or wind.

A. Craw, San Francisco, has recorded this insect from time to time on plum, persimmon, peach, cherry, and walnut-trees from Japan; Prof. Webster, Wooster, Ohio, has recorded it on flowering cherry (*Prunus pendula*), and *P. pseudo-cerasus*, from that country; and Mr. Cooley, Mass., also found this insect on *Prunus nume* and *P. subhirtella*, which were also imported from Japan.

The author found it on the following hosts: *Fuglans sieboldiana* (Onigurumi), *Prunus pseudo-cerasus* var. *sieboldi* (Yoshino-zakura), *Prunus buergeriana* (Inn-zakura), *Ulmus* sp., mulberry-tree (Kuwa), *Paulownia imperialis* (Kiri), *Zanthoxylum piperitum* (Sansho), *Prunus persica* var. *vulgaris* (Momo), cherry-tree (Sakura), pear-tree (Nashi), grape (Budo), *Diospyros kaki* (Kaki), *Broussonetia kazinoki*

(Kozo), (Some-Kusagi), *Elæagnus macrophylla* (Gumi), *Pterocarya rhoifolia* (Sawa-gurumi), *Orixa japonica* (Ko-Kusagi).

The size, shape, and color of the female scales differ more or less on different hosts, although these variations are also due to the stage of the insects and to surrounding conditions. The female scales on *Prunus mume* and cherry-tree are larger, flatly convex, and ash-gray with yellowish exuviae; on the mulberry-trees and on *Diospyros kaki* they are almost equal in size to those on *P. mume*, and are the same in general appearance, except that they are of a lighter color; on other hosts they are more convex and smaller. When the scale is young the exuviae are usually reddish and the scale snowy white. Such differences may be sufficient to base subspecies upon, but upon examining the female with the compound microscope, there is no difference in the characters upon which the classification is based.

50. *Diaspis crawii* Ckll.

Diaspis crawii COCKERELL, Psyche, Vol. VIII, 1897, p. 190. CRAW, Rept. Calif. St. Bd. Hortic., 1897-98, p. 111

This species was found by the author on *Elæagnus umbellata*, in Chikujō-gun, Kiushiu, Japan. It has been recorded on a tree from China by Mr. A. Craw, San Francisco.

Genus *Aulacaspis* Ckll.

51. *Aulacaspis rosæ* Bouché.

Diaspis rosæ COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 312. MASKELL, Ent. Mon. Mag., Vol. XXXIII, 1897, p. 241.

This species was found by the author on rose-bushes in Yokohama, Gifu, and Aichi-ken. Previous to this A. Koebele had found it on *Elæagnus macrophylla* and *Trachelospermum jasminoides*, in Japan.

Genus *Leucaspis* Sign.52. *Leucaspis japonica* Ckll.

Leucaspis japonica COCKERELL, Psyche, Vol. VIII, 1897, p. 53. CRAW, Rept. Calif. State Bd. Hort., 1897-98, p. 111.

This species was found by the author on apple-trees in Sendai, and Sapporo, on maple and *Paeonia moutan* (Botan) in Hirosaki, and on the same host in Yokohama. A. Craw, San Francisco, had already recorded it on broom, *Magnolia souleana*, and *Acer* sp. from Japan. It is extremely numerous in Sapporo, and no doubt is injurious to the fruit trees also.

53. *Leucaspis bambusæ*, sp. nov.

PLATE XIII, FIGS. 75-81.

Scale of Female.—Length usually 2 to 3 mm.; nearly parallel-sided, straight, though sometimes curved, gradually broadened posteriorly; convex, and moderately thick in texture; color snow-white; exuviae about 1. mm. long; first skin light brown, elliptical; second, slightly darker.

Female.—Body very slender, narrower toward anterior end and broader toward posterior end. Abdominal segments distinct. The last segment is yellowish and presents the following characters:—

There are five groups of spinnerets. The anterior group contains five, the anterior laterals nine to eleven, and the posterior lateral seven to nine. There are two pairs of well developed and conspicuous lobes; those of the median pair parallel with each other, each one being furnished with a notch on each side; second pair flat, each lobe being divided into two nearly equal lobules, the larger of which is mesal, each lobule being furnished with a notch on each side. Plates shorter than the lobes, but very distinct, forked at the tip; two between median lobes, one between median and second lobes, three between second lobe and gland spine. Gland spines are prominent; formula, 1, 1, 2—3. First spine on the lateral margin of the median lobe, second spine at the middle of the margin of the second lobe, and third spine on the margin laterad of the second lobe.

Newly Hatched Larva.—Length .3 mm., width .11 mm.; elliptical; pale in color; distinctly segmented. Mouth-parts large; rostral loop long. Antennae and legs well developed. Antennae six-segmented; formula, 3, 6 (1, 2, 4, 3); segment 3 much the longest. Three pairs of legs subequal; femur very broad; tarsus short. Caudal end of body with two long hairs.

This species was found by the author on bamboo, in Kokura, Kiushiu.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Hemichionaspis* *Ckll.*54. *Hemichionaspis aspidistræ* *Sign.*

Hemichionaspis aspidistræ SIGNORET, Essai, 1869, p. 443.

Chionaspis aspidistræ CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 35.

COOLEY, Special Bull. Hatch. Exper. Station, Mass., 1899, p. 45. (The Coccidæ, Genera Chio. and Hemichio.)

This species was found by the author on *Aspidistra lurida* (Haran) and on an orchid in the Yokohama Nursery, Yokohama. A. Craw, San Francisco, had already recorded it on *A. lurida* from Japan.

55. *Hemichionaspis minor* *Mask.*

Hemichionaspis minor MASKELL, Trans. & Proc. New Zealand Inst., Vol. XVII, 1884, p. 33.

This species was found by the author on orange-trees in Kiushiu and Wakayamao-ken. The male scales are usually grouped on the under side of leaves or small twigs. This is the first time it has been recorded from Japan.

56. *Hemichionaspis minor* var. *strachani* *Cooley.*

Hemichionaspis minor var. *strachani* COOLEY, Special Bull. Hatch. Exper. Station, Mass., 1899, p. 54.

This species was found by the author on *Cycas revoluta*, in the grounds of the Capitol of Hukuoka City. This is the first time it has been recorded from Japan.

Genus *Chionaspis* *Sign.*57. *Chionaspis euonymi* *Comstock.*

Chionaspis euonymi COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 313.
CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 38.

This species was found by the author on *Euonymus japonica* (Masaki) in Sapporo and in Yokohama. A. Craw

San Francisco, had already recorded it on the same host from Japan.

58. *Chionaspis bambusæ* Ckll.

Chionaspis bambusæ COCKERELL, Psyche, Supp., 1896, p. 21; Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 54.

This species was found by the author on the leaves of bamboo, in Akabane. Previous to this O. Takahashi, Tokyo, sent specimens of the same to the Division of Entomology, U. S. Department of Agriculture, from which Professor Cockerell described the species.

59. *Chionaspis* (?) *hikosani*, sp. nov.

PLATE XIII, FIGS. 82 AND 83.

Scale of Female.—Very long and slender; length about 2.5 mm., width .4 mm.; sides straight, parallel, sometimes curved; color snow-white. First skin elliptical, almost transparent; median longitudinal ridge distinct; antennæ prominent; second skin very much longer, slightly convex, posterior end yellowish; exuviae .75 mm. long.

Female.—Adult female very small; length less than 1 mm., width about .3 mm. Last abdominal segment presents the following characters:—

One pair of median lobes, short, diverging, and slightly notched on inner margin. One large gland-spine laterad of each median lobe. The plate-like margins are broad, rounded, and serrulate. Second pair of gland-spines rising from lateral side of the plate-like margin; the third pair of gland-spines is very conspicuous, being separated by a plate-like margin; first pair of spines on each side of median lobe near base; second pair of spines on plate-like margin near the lateral margin; third pair near the base of third pair of gland-spines. Spinnerets wanting.

This species was found by the author on *Phyllostachys bambusoides* (Ya-dake) at Hikosan, Kiushiu.

C. L. Marlatt, who has examined the specimens, says: "The structure of the female somewhat approaches genus *Leucaspis*, but the scale is entirely different from the *Leucaspis* type. To properly place it, one should have the male, which is wanting."

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

60. *Chionaspis platani* Cooley.

Chionaspis platani COOLEY, Special Bull. Hatch Exper. Station, Mass., 1899, p. 36. (The Coccidæ, Genera Chio. and Hemichio.)

This species was found by the author on *Rhus* sp. in Aomori City. This is the first time it has been recorded from Japan.

61. *Chionaspis wistariæ* Cooley.

Chionaspis wistariæ COOLEY, Can. Ent., Vol. XXIX, 1897, p. 290; Special Bull. Hatch Exper. Station, Mass., 1899, p. 39. (The Coccidæ, Genera Chlo. and Hemichio.) CRAW, Rept. Calif. State Bd. Hort., 1897-98, p. 110.

This species was found by the author on *Alnus japonica* (Hanno-ki) *Salix babylonica* (Shidare-yanagi), and *Salix* sp. in Gifu-ken. A. Craw has also recorded it on wistaria from Japan.

62. *Chionaspis colemani*, sp. nov.

PLATE XIII, FIG. 84.

Scale of Female.—Length about 2 to 2.5 mm., width about 1.5 mm. Decidedly broadened posteriorly; moderately strong in texture; color, pale straw-white. Exuviae, 1 mm. long, first skin about .3 mm. long, elliptical, slightly broadened posteriorly; a median longitudinal ridge; antennæ prominent; color transparent. Second skin, large; slightly convex; posterior end orange-yellow.

Female.—Body of the female rather long and slender; length 1.2 to 2 mm.; width .5 to 1 mm.; elliptical in outline. The last abdominal segment presents the following characters: the lobes are very inconspicuous; the median lobes almost invisible, pointed; the second lobes are very small, being simply an angular projection of the body-wall; the third lobes are about twice as large as the second and project a little beyond the margin of the segment. The second and third lobes are more or less ciliated. Many suboval, thickened bodies in near the margin are very conspicuous as shown in the figure. The gland-spines are arranged as follows: 1, 1, 2, 1, 1, 1; they are similar except that the last one is forked; one between first and second lobes, one between second and third lobes, two laterad of third lobes and three more beyond that. Spines are prominent, extending beyond plates. The first pair are situated near the lateral margin of the first lobes; the second about the lateral margin of the base of the outer lobules of the second lobes; the third pair on the lateral margin of the third lobes; another pair of spines outside of the third lobes. There are five groups of spinnerets; the anterior group contains seven to ten; the anterior laterals, twelve to sixteen; the posterior laterals, nine to fifteen.

Scale of Male.—Length about .8 mm.; slender, convex; color grayish white.

Egg.—Length about 2 mm.; oval; pale in color.

Found by the author on bamboo, Hikosan, in Kiushiu, and named in honor of Mr. G. A. Coleman of Stanford University.

This new species is allied to *C. bambusæ* Ckll., but is distinguished from it by having a rather short and very broad female scale, with many ridges on the dorsal aspect, as in a certain mollusca. There is also a difference in the arrangement of the gland-spines and in the shape of the plates.

Prof. R. A. Cooley of Montana Agricultural Station, who kindly examined my specimens, writes as follows:—

"The specimens you sent me were rather troublesome. I made several attempts at determining them and even went so far as to write you a letter which I later withheld. I have again reviewed the matter to-day [Nov. 6, 1901] and after an extended comparison feel sure that your species is a new one.

"It is near *C. bambusæ* Ckll., and is also near *C. doxylei* Mask.

"While we cannot do better than to place it in the genus *Chionaspis* at present, it is certain that it does not belong to *Chionaspis* proper."

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

Genus *Parlatoria* Sign.

63. *Parlatoria pergande* Comstock.

Parlatoria pergande COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 327. CRAW, Rept. Calif. State Bd. Hort., 1897-98, p. 98.

This species was found by the author on orange-trees, in Kokura. A. Craw, San Francisco, has also recorded it on the same host from Japan.

64. *Parlatoria pergande*, var. *theæ* Ckll.

Parlatoria pergande var. *theæ* COCKERELL, Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 55; Psyche, Supp., 1896, p. 21.

This species was found by the author on *Acer crataegifolium* (Uri-kaede) in Kyoto, on *Acer pictum* var. *mono*

(Itaya-kaede) in Osaka, on *Diospyros kaki* in Chikujō-gun, Kiushiu, on rose in Gifu-ken, on apple in Tokyo, on *Cornus macrophylla* (Mizuki) and *Osmanthus fragrans* (Mokusei) in the Yokohama Nursery, Yokohama, and on *Hibiscus syriacus* (Mukuge) in Sendai.

This scale is widely distributed and is very destructive to the ornamental trees and plants.

65. *Parlatoria proteus* Curt.

Parlatoria proteus CURT. SIGNORET, Essai, 1867, p. 450. CRAW, Rept. Calif. State Bd. Hort., 1897-98, p. 112. MASKELL, Ent. Mon. Mag., Vol. XXXIII, 1897, p. 241.

This species was found by the author on *Angræcum falcatum* (Furan) in Yokohama. A. Craw, San Francisco, has recorded it on orange-tree, and A. Koebele on camellia and *Machilus* from Japan.

Genus *Fiorinia* Targ.

66. *Fiorinia fioriniæ* (?) Targ.-Tozz.

Fiorinia fioriniæ (?) TARGET-TOZZINI. SIGNORET, Essai, 1896, p. 449.

This species was found by the author on fern in the Yokohama Nursery, Yokohama. A. Craw, San Francisco, has also recorded it on camellia from Japan.

67. *Fiorinia fioriniæ* Targ.-Tozz. *japonica*, var. nov.

This variety differs from the typical *F. fioriniæ* by having numerous spinnerets, particularly in the lateral groups:—

Anterior group, 3 to 4; anterior lateral groups, 16 to 22; posterior lateral groups, 24 to 27. The other characters are identical.

Found by the author on *Podocarpus chinensis* (Maki) in the grounds of the Nishigahara Experiment Station, Tokyo, and Gifu-ken, and on *Pinus* sp. in Shiga-ken.

Genus *Mytilaspis* Sign.68. *Mytilaspis pomorum* Bouché.

Mytilaspis pomorum BOUCHÉ. COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 325.

This species was found by the author on apple, *Mespilus*, *cuneata*, and currant in Sapporo, on willow in Aomori, on apple in Sendai and Morioko, on orchid in Yokohama, and on *Ilex crenata* (Inu-tsuge) in Hikosan. There is considerable variation in color, those on *Mespilus cuneata* (Sanzashi) being light brown, those on currant dark brown, and those on apple grayish. This insect though not recorded has been known in Japan for some time.

69. *Mytilaspis pomorum* Bouché *japonica*, var. nov.

Scale of Female.—Dark with yellowish brown exuviae.

Female.—Yellowish in color; posterior region of the body very much wider than the thoracic region. Anterior group of spinnerets consists of four to eight, anterior laterals, eleven to sixteen, and posterior laterals, seven to twelve. The lobes are of the same shape as those of the typical *M. pomorum* but much smaller. The notches on the lobes are not quite so distinct as in the type.

This species was found by the author on *Abies firma* (Inu-kaya) in Hikosan, Kiushiu.

70. *Mytilaspis euryæ*, sp. nov.

PLATE XIII, FIGS. 85-89.

Scale of Female.—Length 3-4 mm.; long, narrow, widened posteriorly, straight, sometimes curved; color dark brown. First skin pale brown, showing segmentation distinctly, second skin more or less covered by the secretion.

Female.—Length 1.35 mm., width .6 mm.; color pale brown, posterior region yellow. The last abdominal segment presents the following characters:—

There are five groups of spinnerets. The anterior group consists of four to five, anterior lateral, seven to nine, and posterior lateral, seven to eight. Lobes small; median lobes rounded, usually notched on the lateral margin near tip; second pair flat, each lobe being divided into nearly equal lobules, the larger of which is mesad. Plates simple, spiny and tapering; two between meso and second lobes, three outside of the second lobes. Spines

inconspicuous; the first pair situated near the lateral margin of the base of the first lobes; the second, about the middle of the base of the second lobes; the third, laterad of the base of the third lobes.

This species was found by the author on *Eurya ochnacea* in Hikosan, Kiushiu.

Type in the Entomological Collection of Leland Stanford Jr. University, and co-types in the author's collection.

71. *Mytilaspis gloverii* Pack.

Mytilaspis gloverii PACKARD. COMSTOCK, Ent. Rept. U. S. Dept. Agric., 1880, p. 323.

This species was found by the author on orange in Gifu-ken and orange leaves and twigs in Kiushiu and Wakayama-ken. The scales on the twigs were very much darker than those on the orange. This is the first time it has been recorded from Japan.

72. *Mytilaspis citricola* Pack.

Mytilaspis citricola PACKARD. MASKELL, Ent. Mon. Mag., Vol. XXXIII, 1897, p. 241.

This species was found by the author on orange-tree in Chikugo-gun, Kiushiu, and on *Cercidiphyllum japonicum* (Katsura) in Hirosaki. A. Koebele has also recorded it on *Taxus cuspidata* (Ichii) in Japan.

73. *Mytilaspis newsteadi* Sulc.

Mytilaspis newsteadi SULC, S. B. bohm. Gesell., 1895, No. XLIX, pp. 8 and 19.

This species was found by the author on the leaves of *Thea japonica*, Tokyo. This is the first time it has been recorded from Japan.

74. *Mytilaspis newsteadi* Sulc. *tokionis*, var. nov.

This variety differs from the typical *M. newsteadi*, first, in being larger and more slender; second, in having the median lobes more or less diverged and each side abruptly

narrowed, then prolonged more or less into a point, with the margins slightly serratulate.

The male scale is narrower than the typical *M. newsteadi*.

This species was found by the author on *Codiaeum* sp. in a green-house in Tokyo. It is a very destructive pest, particularly to the above named plant.

75. *Mytilaspis crawii* Ckll.

Mytilaspis crawii COCKERELL, Psyche, Supp., 1896, p. 21; Bull., T. S., No. 4, Div. Ent., U. S. Dept. Agric., 1896, p. 45. CRAW, Rept. Calif. State Bd. Hort., 1895-96, p. 41. MASKELL, Ent. Mon. Mag., Vol. XXX, 1897, p. 241.

This species was found by the author on *Quercus* (Pasania) *cuspidata* (Shii) in Tokyo. Previous to this, A. Craw, San Francisco, had recorded it on the same host and on *Elæagnus* from Japan.

Genus *Poliaspis* Mask.

76. *Poliaspis pini* Mask.

Poliaspis pini MASKELL, Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 231; Ent. Mon. Mag., Vol. XXXIII, 1897, p. 242.

This species is widely distributed, being found nearly all over the Empire. The author found it on the following plants: *Pinus austriaca*, *Pinus* sp., *Pinus thunbergii*, *Torreya nucifera*, *Abies firma*, and *Picea bicolor*, in the grounds of the Nishigahara Agricultural Experiment Station, Tokyo; on *Pinus* sp., Kubotesan, Kiushiu; on *Pinus* sp. in Shigaken, and on *Podocarpus chinensis* in Wakayama-ken. A. Koebele has recorded it on *Pinus densiflora*, Miyanoshita, Japan.

The specimens collected in Wakayama-ken, on *Podocarpus chinensis*, are slightly different from the others, although the differences are not sufficient to make a new species or variety. The female scale is light brown, narrower than the others. The spinnerets are fewer in number, particularly those of the posterior lateral groups, and of the middle one of the anterior row of three groups.

III. LIST OF COCCIDÆ RECORDED FROM JAPAN NOT INCLUDED IN THE FOREGOING LIST.

- Dactylopius syringæ* MASK., Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 246.
- Dactylopius edgeworthiæ* CKLL., Am. Nat., Vol. XXX, 1897, p. 589.
- Dactylopius virgatus* CKLL. (= *D. ceriferus* NEWST., Ind. Mus. Notes, Vol. III, 1894, p. 24); Can. Ent., Vol. XXX, 1898, p. 222; Trans. & Proc. New Zealand Inst., Vol. XXIX, 1896, p. 320.
- Phenacoccus pergandei* CKLL., Psyche, Supp., 1896, p. 17; Bull. No. 4, T. S., Div. Ent., U. S. Dept. Agric., 1896, p. 55.
- Sphærococcus populi* MASK., Ent. Mon. Mag., Vol. XXXIII, 1897, p. 244; Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 248.
- Asterolecanium (Planchonia) delicata* GREEN, Ent. Mon. Mag., Vol. XXXIII, 1897, p. 243.
- Asterolecanium variolosum* var. *japonicum* CKLL., Psyche, Vol. IX, 1900, p. 71.
- Lecanium notatum* MASK., Ent. Mon. Mag., Vol. XXXIII, 1897, p. 243; Trans. & Proc. New Zealand Inst., Vol. XXX, 1897, p. 238.
- Lecanium cerasarum* CKLL., Psyche, Vol. IX, 1900, p. 71.
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STANFORD UNIVERSITY,
CALIFORNIA,
September, 1901.

EXPLANATION OF PLATE VII.

Monophlebus corpulentus, sp. nov.

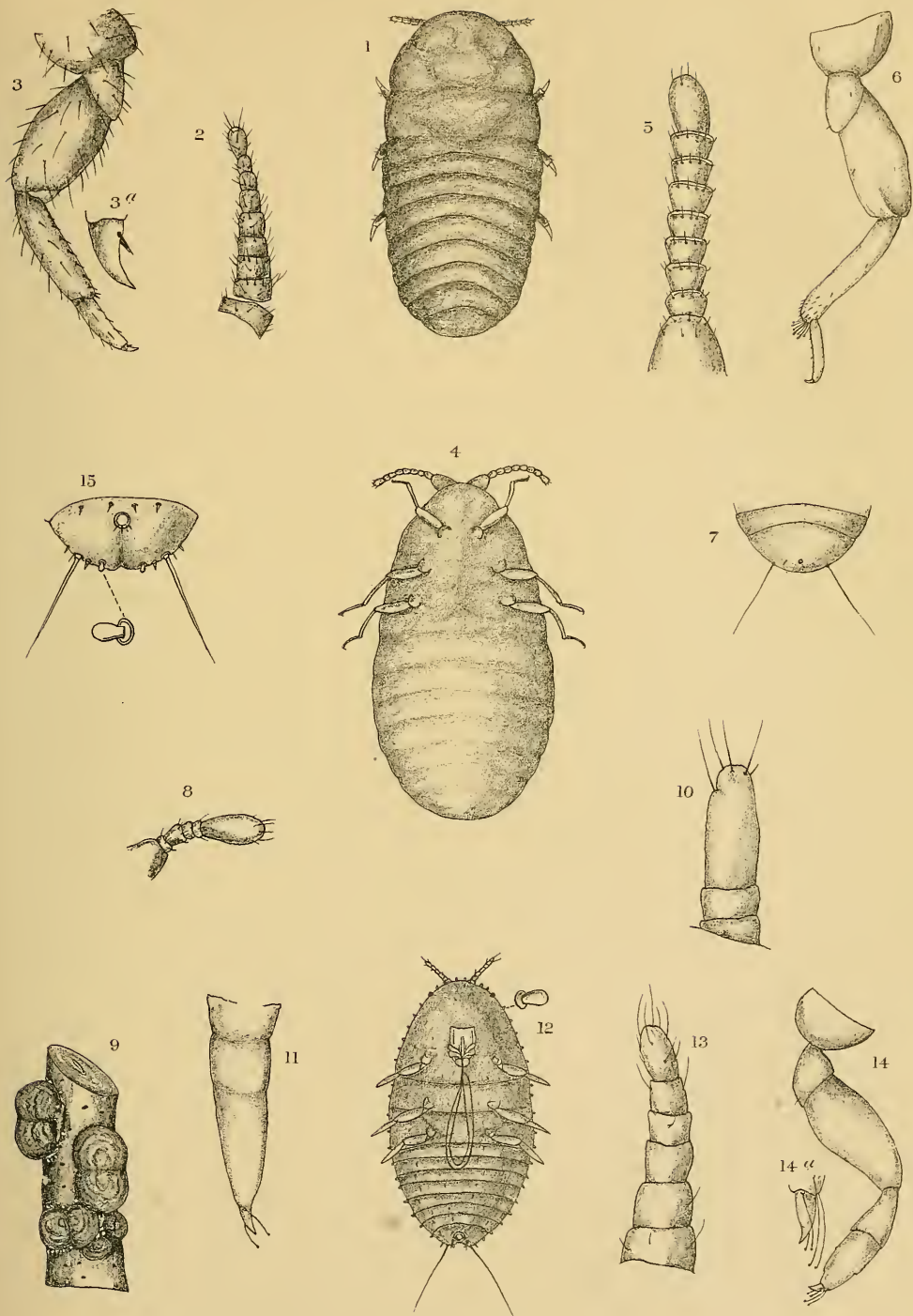
- Fig. 1. Dorsal aspect of female.
- Fig. 2. Antenna of female.
- Fig. 3. Leg of female; 3a, claw.

Sasakia quercus, sp. nov.

- Fig. 4. Ventral aspect of female.
- Fig. 5. Antenna of female.
- Fig. 6. Leg of female.
- Fig. 7. Posterior segment of larva.
- Fig. 8. Antenna of larva.

Kermes nakagawæ, sp. nov.

- Fig. 9. Scales on a twig.
- Fig. 10. Antenna of female.
- Fig. 11. Leg of female.
- Fig. 12. First larval stage (ventral aspect).
- Fig. 13. Antenna of the same.
- Fig. 14. Leg of the same; 14a, claw.
- Fig. 15. Posterior margin of the same.



EXPLANATION OF PLATE VIII.

Kermes narwæ, sp. nov.

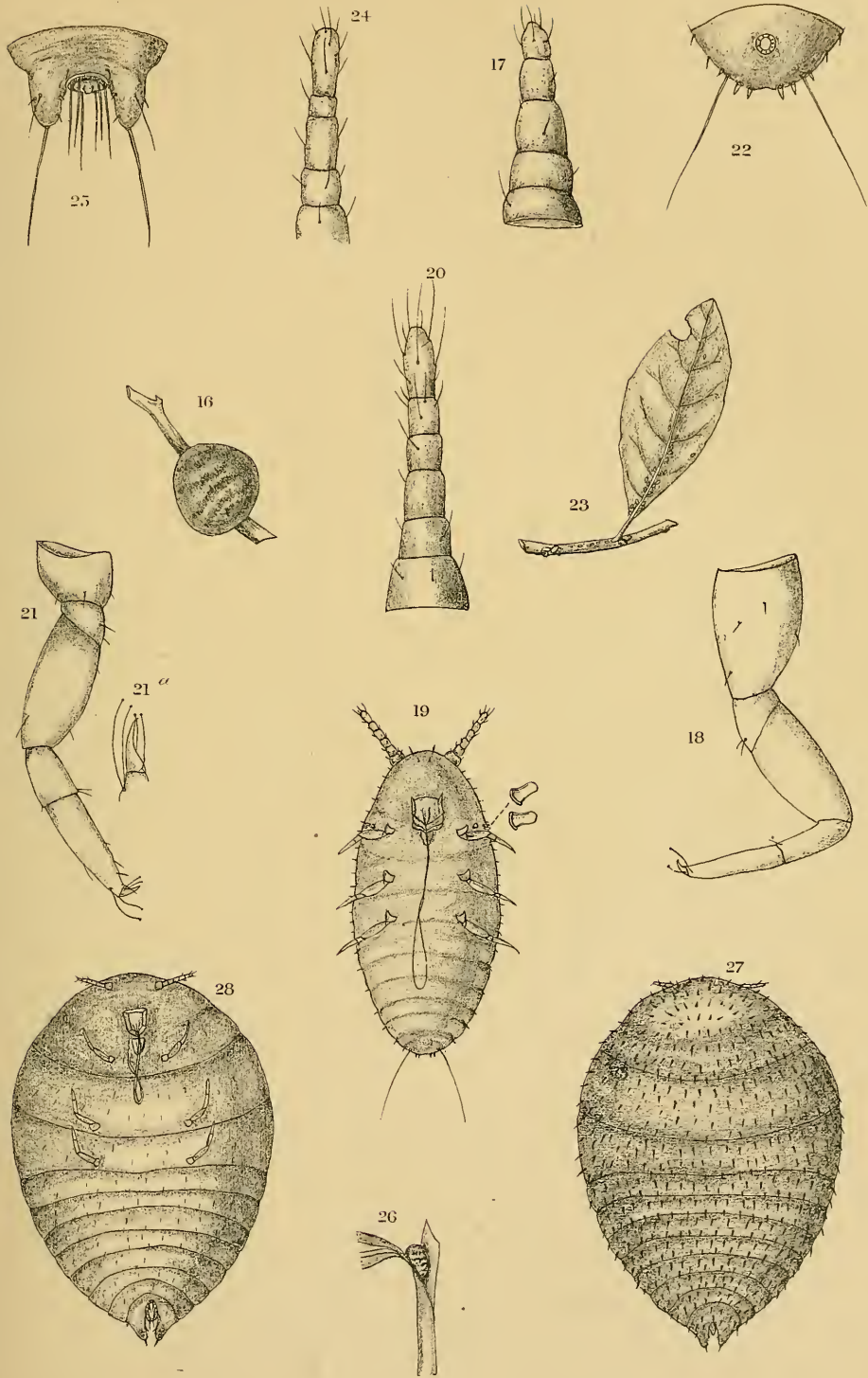
- Fig. 16. Scale on a twig.
- Fig. 17. Antenna of female.
- Fig. 18. Leg of female.
- Fig. 19. Ventral aspect of first larval stage.
- Fig. 20. Antenna of first larval stage.
- Fig. 21. Leg of first larval stage; 21a, claw.
- Fig. 22. Posterior end of first larval stage.

Eriococcus japonicus, sp. nov.

- Fig. 23. Female sacs and male cocoons on a twig.
- Fig. 24. Antenna of female.
- Fig. 25. Posterior end of female.

Eriococcus onukii, sp. nov.

- Fig. 26. Female scale on a twig.
- Fig. 27. Dorsal aspect of female.
- Fig. 28. Ventral aspect of female.



EXPLANATION OF PLATE IX.

Eriococcus onukii, sp. nov.

- Fig. 29. Antenna of female.
Fig. 30. Leg of female.
Fig. 31. Dorsal spines of female.
Fig. 32. Antenna of first larval stage.
Fig. 33. Leg of first larval stage.

Dactylopius comstocki, sp. nov.

- Fig. 34. Antenna of female.
Fig. 35. Leg of female.

Dactylopius pini, sp. nov.

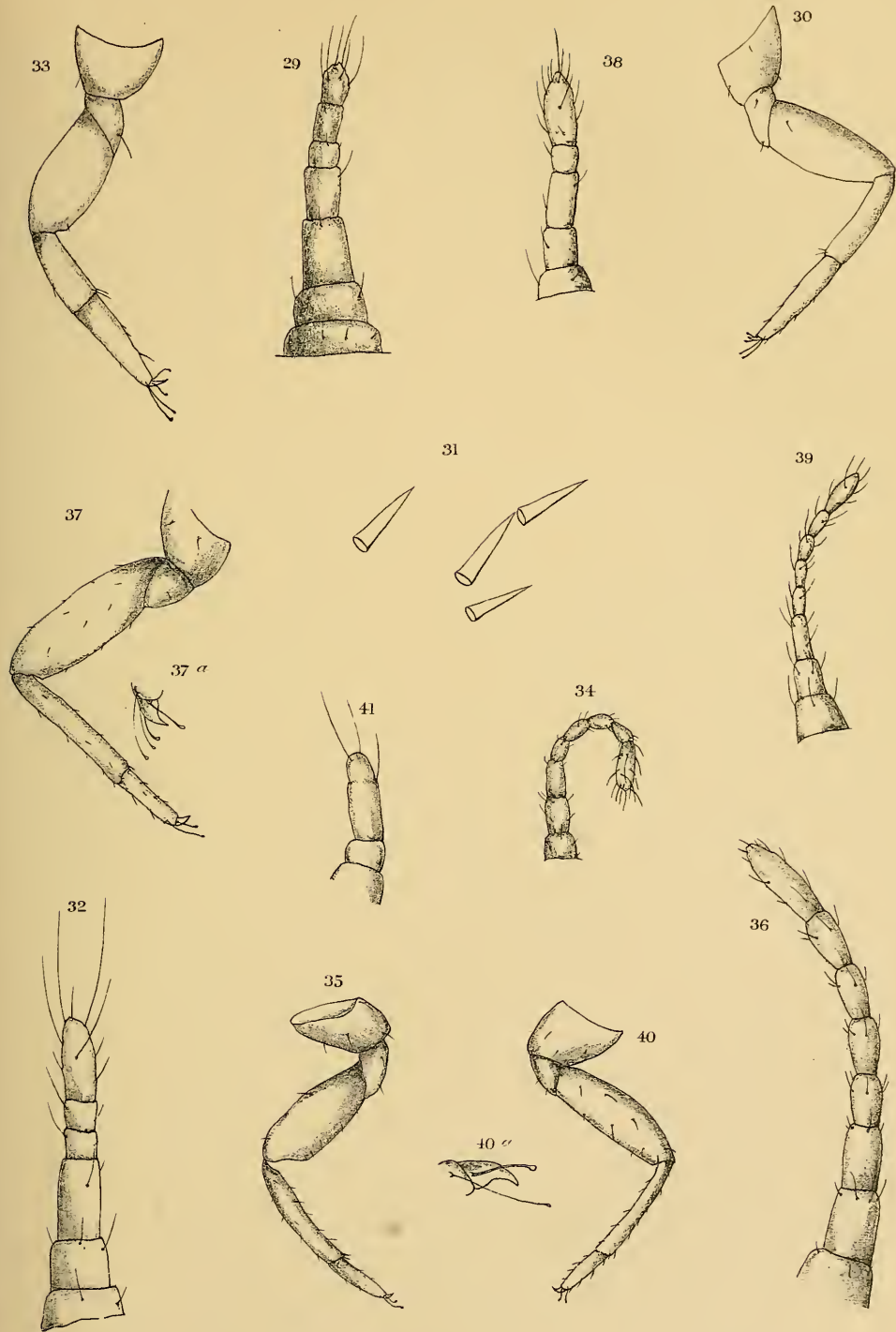
- Fig. 36. Antenna of female.
Fig. 37. Leg of female; 37a, claw.
Fig. 38. Antenna of first larval stage.

Dactylopius kraunhiæ, sp. nov.

- Fig. 39. Antenna of female.
Fig. 40. Leg of female; 40a, claw.

Sphærococcus parvus MASK.

- Fig. 41. Antenna of first larval stage.



EXPLANATION OF PLATE X.

Pulvinaria psidii MASK.

Fig. 42. Marginal spines of female.

Pulvinaria aurantii CKLL.

Fig. 43. Marginal spines of female.

Pulvinaria horii, sp. nov.

Fig. 44. Female scales on a host.

Fig. 45. Marginal spines of female.

Fig. 46. Antenna of female.

Fig. 47. Leg of female.

Fig. 48. Ventral aspect of first larval stage.

Fig. 49. Antenna of first larval stage.

Fig. 50. Leg of first larval stage.

Fig. 51. Marginal spines of first larval stage.

Fig. 52. Anal triangular plates of first larval stage.